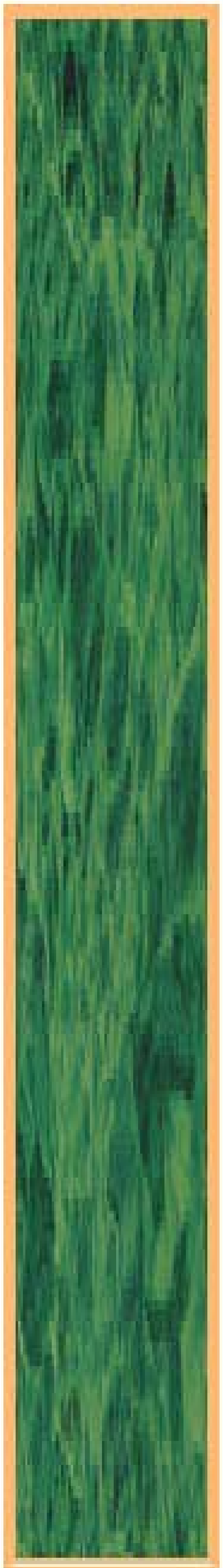

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Facility Disposition: Model Work Plan for Accelerated Project Management

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FACILITY DISPOSITION: MODEL WORK PLAN FOR ACCELERATED PROJECT MANAGEMENT

SECTION 1 - INTRODUCTION

This model workplan is a third piece in a series of information, guidance and training products addressing the application of four "principles" of Environmental Restoration to the Department of Energy's facility disposition activities. Previous products include an Office of Environmental Policy and Guidance (OEPA) document entitled *Facility Disposition: Principles for Accelerated Project Management* (DOE/EH-413-0002), a CERCLA Bulletin developed from experience gained in delivering a DOE training course, *Facility Disposition: Principles for Integrated Safety and Project Management*. The latter was jointly developed and offered by the Office of Environmental Policy and Guidance (EH-41), and a former DOE Center of Excellence, the National Environmental Training Office (NETO).

Facility disposition projects are often expensive, take a long time to plan and implement, and face numerous technical challenges. These challenges are only heightened as DOE implements several initiatives to accelerate schedules and reduce costs, while protecting its workforce, and complying with multiple regulatory and policy requirements. For project managers to meet these challenges, they must use planning techniques that result in more cost-effective decision-making, both prior to starting disposition projects and during projects to respond to changes in facility conditions that were previously unknown or uncertain. This model workplan describes three techniques for meeting the challenges associated with accelerated disposition project planning:

1. How to define a work scope without spending extensive time and dollars collecting all possible data about the facility slated for disposition;
2. How to know when there are enough data to stop planning and start actual disposition work; and
3. How to make sure health and safety hazard analyses and controls are adequate and compliant without spending excessive project resources.

The techniques introduced to address each of these three points, when applied to the planning and implementation phases of the disposition process, have the potential to save valuable DOE resources, both in terms of time and money.

SECTION II – SUMMARY OF PRIMARY REQUIREMENTS FOR D&D PROJECTS

Project managers will apply the techniques outlined in this model workplan in the context of several policy and regulatory processes that govern DOE disposition projects. The primary

DOE requirements for conducting disposition activities are outlined in DOE Order 430.1A, *Life Cycle Asset Management* (LCAM) and four implementation guides associated with the order (DOE G 430.1-2, *Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition*, DOE G 430.1-3, *Deactivation Implementation Guide*, DOE G 430.1-4, *Decommissioning Implementation Guide*, DOE G 430.1-5, *Transition Implementation Guide*). The order and implementation guide can be found on DOE's internet site http://www.directives.doe.gov. Critical portions of DOE Order 430.1A can be found in Appendix A.

In addition, under a 1995 Memorandum of Understanding (MOU) between DOE and EPA *(Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), May 22, 1995), decommissioning activities are considered to be CERCLA non-time critical removal actions. Guidance on how to comply with the implications of this determination can be found in DOE G 430.1-4, *Decommissioning and Implementation Guide*.

Facility disposition project managers should ensure that the measures to meet the requirements of applicable DOE Orders and applicable environmental health and safety regulations, such as those issued pursuant to the Resource Conservation and Recovery Act (RCRA) or the Toxic Substances Control Act (TSCA), are integrated into their accelerated project plans. Of particular importance along these lines is paying careful attention to ensuring compliance of the project with DOE P 450.4 "Integrated Safety Management (ISM) Policy." This critical policy provides the overall DOE framework for the planning and safe conduct of work.

Two recent DOE guidance documents outline in detail recommended overall implementation approaches for effective accelerated disposition projects:

- *Facility Disposition: Principles for Accelerated Project Management*, DOE/EH-413 02 (May 2000); and

- *DOE Technical Standard: Integration of Environment, Safety and Health Into Facility Disposition*, DOE-STD-1120-98.

Both of these documents provide project managers with a detailed explanation on DOE's facility disposition requirements and policies. When combined with the recommended approaches and practices outlined in this model workplan, these resources can aid project managers to plan and implement more effective accelerated disposition projects.

A critical element necessary to implement the ISM policy (assumed to be in place and operating throughout disposition planning) is establishing a multi-disciplinary project team, or a core technical team. The creation of a multi-disciplined project team is the primary mechanism for making effective planning decisions during disposition projects. This model workplan is optimized when decisions are made through this team structure.

SECTION III – FORMAT AND CONTENT OF THIS MODEL WORKPLAN

This document provides guidance on accelerated facility disposition decision-making in the form of a model workplan that illustrates several key planning techniques. This workplan is based on a real facility for which a project manager must make critical work scope, data collection, and health and safety planning decisions.

This model workplan focuses on five critical steps of disposition planning where experience and lessons learned have shown the most resources can be saved and most acceleration can be achieved. These steps are the following:

1. Development of a way to streamline work scope definition/project scope (Section IV.1);
2. Implementation of an effective hazard identification and characterization program (Section IV.2);
3. Implementation of hazard analysis and controls (Section IV.3);
4. Adoption of appropriate hazard baseline documentation (Section IV.4); and
5. Transitioning from planning techniques to work package preparation (Section IV.5).

This model workplan illustrates only a subset of issues that typically make up complete disposition planning documents. Elements that are not included in this model workplan (but typically would need to be developed) include:

- Project management plans - e.g., work breakdown structure, cost estimates, schedule, key assumptions;

- Project organization plans - e.g., staffing, roles and responsibilities, relationship to other projects; and

- Detailed technical engineering documents and step-by-step work procedures.

Background On Model Facility Used as an Illustration of a Metallurgical Research Facility

[Note: The following is the available information on the sample facility that this model workplan uses to illustrate the planning techniques that project managers are recommended to follow. These data will be used throughout the remainder of the workplan.]

<u>Building Description/History</u>

Operations History

- The Metallurgical Research Facility was constructed in 1960.
- Its original mission was to conduct research and testing on plutonium and uranium ceramics and alloys.
- In 1972, the mission of the facility was expanded to include research and testing of metal hydrides containing tritium.
- In 1986 the research and testing mission was terminated. Very limited cleanup of interior rooms, piping, and equipment was performed. Some equipment was dispositioned, but several pieces, or lathing and cutting equipment, as well as laboratory, research, and materials storage equipment, remain scattered throughout the rooms.
- Process records indicate that a tritium fire occurred in a hydriding furnace in 1974. The extent of resulting contamination within the facility is not known from current records.

Current Status

- Currently, limited surveillance and maintenance (S&M) is performed in the old research and testing areas.
- From observations through partially opened doors, a chemical storage cabinet in the laboratory is known to contain approximately 40 jars/small containers of liquid substances. Some of the jars have chemical labels intact; others are unlabeled. No inventory of the chemicals is known to exist.
- Past spills of the chemicals are evident within the cabinet and on the concrete around the cabinet (e.g., through observations of visual staining).
- Consistent with Life Cycle Asset Management (LCAM) S&M guidance, S&M activities include:
    - Ensuring adequate containment of contamination through a series of external alarms and monitors around potential contaminant release points in the building (e.g., roof vents, doors, open spaces within the facility);
    - Physical control of facility access and routine security personnel external inspections;
    - Quarterly monitoring/checking of systems and alarms.

Physical Features

- The facility is one story and approximately 5,600 ft^2.
- There are four rooms total: two rooms that were used for the plutonium and uranium ceramics and alloys research (2,000 ft^2 and 1,700 ft^2); a small office (200 ft^2); a central hallway (100 ft^2); and one room that was added on in 1972 and was used to test metal hydrides containing tritium and the hydriding furnace (1,600 ft^2).
- It is constructed of steel beams and concrete. The walls contain paint over the concrete. The ceiling, which is also concrete, has a sub-ceiling containing insulation and a soft board covering.
- There is an extensive pipe system originally used for drainage into tanks for proper disposal. The facility records do not detail the process employed to drain and clean the pipes at the time the facility was shut down and surveillance and maintenance activities initiated.

Building Systems

- The building HVAC is operational but reliability is unknown.
- The monitoring and inspection systems are intact and have revealed small amounts of residual contamination within the HVAC system itself. On two occasions since 1990 there have been recordable releases of materials within the facility but no evidence of external release of any substances.

Contaminants Known to Be Present

- Approximately 5 kilograms of material is suspected to remain in the old process equipment (furnaces, screening stations, etc.) and ventilation ducts. The material likely consists of, PU-238, PU-239, PU-241, U-235, U-233, and U-237 in various forms (fine powder residues, metal filings and shavings).
- Some areas of the facility (roof, insulation) most likely contain asbestos as well as lead paint on the walls.

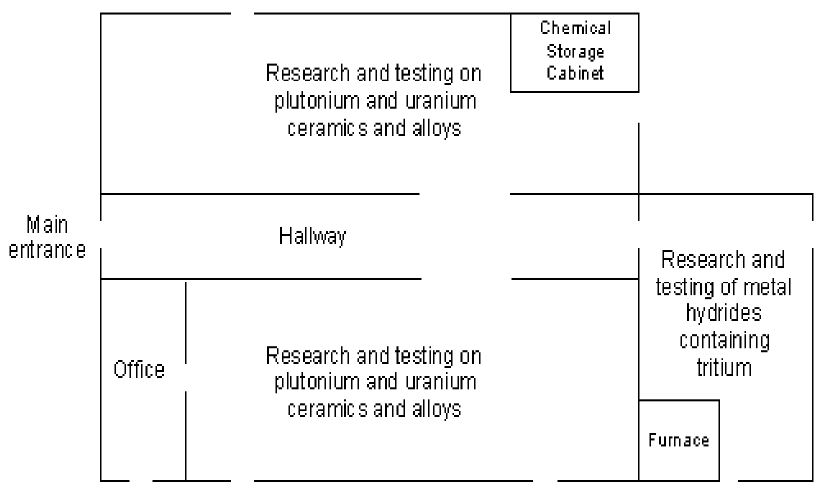
- Unidentified jars of chemicals are contained in a chemical storage cabinet, although given the process history of the facility; they are expected to be a variety of typical organic laboratory chemicals. The inside of the cabinet has significant corrosion deposits.
- Smearable contamination in many areas exceeds 2,000,000-dpm/100 cm^2. Fixed contamination levels exceed 1,000,000-dpm/100 cm^2.
- The machinery also likely contains small amounts of oils and operating fluids, which are likely to be contaminated with radionuclides and potentially hazardous substances.

Waste Management Facilities

- Site has on-site waste management capacity for LLW (low level waste), mixed LLW, and hazardous waste treatment, storage, and disposal. The site sends Greater than Class C LLW and TRU (transuranic) waste off-site for management.

Layout of Facility

- This diagram shows a plan view of the facility.



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SECTION IV - MODEL WORK PLAN FOR ACCELERATED PROJECT MANAGEMENT METALLURGICAL RESEARCH FACILITY (MRF)

IV.1 – TECHNIQUES TO STREAMLINE WORK SCOPE DEFINITION/PROJECT SCOPE

NOTE ON FORMAT:
The left side of this model workplan provides general guidance and examples for the project manager of each of the techniques; the right side provides additional references and commentary about how this example illustrates streamlining techniques.

Key Concepts Illustrated: A primary objective when planning a disposition project is to define a safe work scope to disposition the facility so that it meets appropriate end states and end points. Traditionally, however, this task has involved compiling and collecting substantial amounts of new data to fill gaps that exist in available information. This is because a project manager is typically faced with a large number of unknown or uncertain conditions for which data collection is often seen as the only solution. Collection of new data, however, is both costly and can take substantial time to gather and analyze. A critical streamlining opportunity exists if project managers can use the planning techniques that follow to limit the amount of new data collected to that which is truly needed to safely plan the required work. Likewise, project managers can then rely on other approaches to address uncertainties that either are not significant, or for which no amount of new data will help make the necessary decision.

Although some guidance is already available on the amount of data needed to make decisions (i.e., how the use of "graded approach" may allow a reduction in the need to comply with certain requirements), disposition projects have no clear method to determine when data are sufficient to proceed. This model workplan offers a systematic approach that will help project managers better establish when data are sufficient to make required decisions and prevent the collection of unnecessary data.

The following are the elements of the systematic approach, along with examples that illustrate each of these concepts:

1. *Define end state* **-** Identify the specific condition(s) that

Key guidance documents to assist in defining project scope include:
- *Facility Disposition: Principles for Accelerated Project Management, DOE/EH-413 02 (May 2000)*; and
- *Facility Deactivation Guide, Methods, and Practices Handbook: Emphasizing End Points Implementation, EM-60, December 1996*.

Minor changes to end states and

must be reached for each of the facility's spaces, systems, and major equipment.

<u>Example end state</u>: Removal of cutting lathe from the facility.

end points can have substantial work scope impacts and need to be carefully evaluated. For example, if the end state was "Removal of cutting lathes from the facility and <u>removal of any residual contaminants from the floor</u>," (rather than "removal of cutting lathe from the facility"), the end points and decisions would also have to define the scope of residual contamination and include plans for subsequent decontamination of these contaminated surfaces.

2. *Define end points* **-** Establish specific sub-conditions to reach throughout the project for a facility's spaces, systems, or major equipment.

<u>Example End Points</u>: (1) drain all accessible liquids from the lathe equipment and manage them as hazardous; radioactive, or mixed waste. (2) decontaminate surface areas of equipment to remove all non-fixed contamination; (3) remove lathe and dispose of it as mixed waste debris at an on-site disposal facility after proper packaging.

End points can also include quantitative information, such as the levels that will define when "decontamination" is complete.

3. *Define the <u>decisions</u> required to meet the end points* - To achieve an end point, a project manager will be required to make certain decisions to establish what, if any, actions are required.

<u>Example Decisions</u>: (1) Are residual liquids hazardous, radioactive, or mixed wastes? (2) Are TRU wastes present on or in lathe? (3) What surrounding hazards are present that require mitigation before disposition activities start or during any removal of the lathe?

Although end points define the objectives that disposition activities must achieve, they are not generally sufficient by themselves to be complete project plans. Often, end points frame key decisions that project managers must make before preparing project plans. In turn, these decisions are the basis for determining whether sufficient data exist to proceed. These "decisions" are analogous to the framework established by EPA's Data Quality Objectives (DQO) process.

4. *Evaluate the* *<u>uncertainties</u>* *that could affect the decision rules and data collection approaches* – Identifying and evaluating <u>significant</u> uncertainties early can prevent unnecessary data collection. An uncertainty analysis helps identify significant uncertainties by: (1) identifying expected conditions and determining potential deviations from these conditions; (2) assessing the likelihood that deviations from expected conditions will occur; (3) evaluating the potential impacts these deviations will have on the protection of human health and the environment; and (4) evaluating the time needed to respond to encountering an unexpected condition. Many uncertainties will exist in a project; but approaches other than data collection may better address the uncertainty.

To make the decisions that this systematic approach generates, project managers should evaluate which of an array of strategies is appropriate to implement. This can often be done using a technique called uncertainty analysis. This technique helps decide when more data collection is truly the best strategy to employ, but also when the uncertainty will remain regardless of any data collection that occurs, thereby requiring an approach such as ongoing monitoring or contingency planning to be implemented.

<u>For example</u>: An uncertainty in this example may be whether pieces of radiologically contaminated debris (e.g., bulk nuclear materials) from cutting events may be found when sampling the area or removing the lathe that could pose unanticipated waste management or health and safety consequences. Although a one-time visual inspection may help address this uncertainty, it is prudent in this case to establish a contingency of what actions to take should the visual inspection not find some cuttings. This is an example where a data collection approach may not address the uncertainty.

5. *Establish the* *<u>decision rules</u>* *and* *<u>subsequent data collection approaches</u>* - A decision rule is a statement that links the decision to the consequences or action to be taken. It usually comes in the form of an Aif-then@ statement. It also defines the circumstances for which data collection might be needed, also using the tenets of the DQO process to focus data collection only to cases where it is needed to support a relevant decision.

Decision rules provide further clarification about how information will be used to inform the key decisions. Decision rules also can be quantitative and detailed enough to specify analytical techniques and decision thresholds.

<u>Example of decision rule</u>: If limited sampling determines that TRU wastes are present, then manage wastes in accordance with site TRU waste handling and certification requirements.

Comprehensive Example Applied to MRF Facility

<u>End State</u>: The disposition of the MRF will result in an end state condition where all hazards are removed, equipment is

This <u>end state</u> makes clear that removal of all equipment and

dismantled, and the building is left in a safe facility configuration for future reuse or a state ready for demolition with minimal surveillance and maintenance.

Primary Decisions: Given the anticipated end state, the primary decisions to be made concern the process of dispositioning all machinery, tanks, waste, and other materials. Specifically, because of the need to identify proper waste management options, the key decisions are: (1) whether the machinery, tanks, and wastes within the facility are TRU wastes, greater than Class C LLW wastes, less than Class C LLW wastes, mixed wastes, hazardous wastes, or other wastes (e.g., PCBs regulated under TSCA); and (2) how to approach removal of the equipment and other waste-containing units safely prior to facility demolition or remediation for potential reuse.

For this facility, end points now must be defined for six spaces, systems, or major equipment areas: (1) the process machinery; (2) chemical storage cabinet; (3) walls/floors of the structure; (4) ventilation ducts; (5) pipes and tank systems; and (6) hydriding furnace.

demolition of the building needs to occur. Therefore, the primary decisions focus on appropriate disposition of materials generated during this work. The end state also reflects the possibility that the facility may be demolished or could remain standing for future reuse. This lack of a fixed end state decision is common at DOE sites. The impact of either final end state must be evaluated in the end points and other work scope decisions that follow.

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#1 - For the <u>process machinery</u> remaining throughout the facility:

<u>End Point</u>: Remaining process machinery will be decontaminated to release limits allowing for free release and/or will be removed and managed in accordance with appropriate waste handling requirements.

This is an example of an end point.

<u>Work Scope Decisions to Be Made</u>: (1) Does machinery contain TRU waste or Greater Than Class C Waste as defined by DOE Order 435.1? (2) Does machinery contain other contaminants that would impact waste categorization? (3) Based on currently available information, is further data collection necessary to define the work scope to achieve the end point?

These decisions are critical to determining whether materials can be managed on site or must be sent off site.

<u>Evaluating Uncertainties to Support Decision-making</u>:
1. Types of radioactive contaminants present

- *Expected Condition*: Machinery does not contain TRU nuclides greater than TRU waste thresholds using non-destructive assay or > Class C concentrations.
- *Reasonable Deviation*: Machinery contains TRU nuclides greater than TRU waste thresholds using non-destructive assay or > Class C concentrations.
- *Probability of Occurrence*: High. The 5 kg of material remaining in the process equipment is likely to contain TRU nuclides, including PU-239 and PU-241.
- *Impacts:* Significant. This is a critical uncertainty for both the waste management issues (i.e., equipment would need to be removed and managed in accordance with off-site facility waste acceptance criteria (WAC) that can accept TRU and > Class C waste) and for health and safety consideration.
- *Strategy*: Likely to require limited sampling to address.

This analysis helps the project manager determine what alternatives exist that can reduce the uncertainties prior to sampling. For example, uncertainties can be reduced through establishing on-going monitoring approaches or contingency plans. In this case, however, knowing whether the waste is TRU is critical because a project manager needs significant planning time to ensure TRU waste certification requirements are met.

2. Other contaminants present

- *Expected Condition*: Machinery only contains radioactive wastes.
- *Reasonable Deviation*: Machinery contains a combination of radioactive and/or hazardous wastes.
- *Probability of Occurrence*: High. The radioactive material likely present in the process equipment is expected to contain small amounts of oils and operating

In this case, it is unlikely that any amount of reasonable sampling will completely address all possible waste management configurations.

fluids likely contaminated with radionuclides and hazardous constituents.

- *Impacts*: Significant. Delays could occur if contaminants require changes in waste handling, remediation, transportation, and disposal procedures.
- *Strategy*: Will need contingencies prepared in workplan to address a wide variety of possibilities.

Work Scope Decision Rules:

1. If machinery contains TRU nuclides greater than TRU waste thresholds using non-destructive assay (NDA), or contains >Class C concentrations, then remove equipment and manage in accordance with off-site facility waste acceptance criteria (WAC), otherwise plan to remove and manage wastes to allow their acceptance in on-site facilities.
2. If machinery contains a combination of radioactive wastes, and does not meet the definition of TRU, then handle as low level waste and send to the on-site LLW storage facility after proper packaging and notify the waste management department to identify the proper disposition path. If hazardous constituents are present, treat as mixed low level wastes, identify the appropriate RCRA treatment standards, and determine if on-site treatment or management capacity exists. Otherwise, if wastes contain PCBs, manage in accordance with the site's PCB Waste Management Plan.

Examples of decision rules. In combination with decision rule #1, contingencies can be defined that pre-determine how different types of wastes can be managed. In addition, the decision rules could be expanded to include the specific waste characterization techniques that will help the project manager make the decisions.

Data Collection/Characterization Strategy: Machinery will be characterized to ascertain highest areas of contamination. Data will be taken from logical points on the machinery where materials may be have been collected and from any liquids (e.g., oils, lubricants) remaining in the machinery that may have come in contact with contaminants and can be sampled in sufficient amounts.

Sampling Strategy:

1. Perform visual inspection to confirm if sampling matrix is liquid or solid.
2. NDA information/surveys will determine waste locations.
3. Liquid/solid samples will be collected if volume is adequate (using composite sampling).
4. Table below outlines analytical approaches.

This data collection strategy would become part of a more detailed sampling plan or work package and is only shown here to carry through the example from the initial end state/end point determination down to the detailed task level. Using each step in this systematic process should lead to data collection only when it is the best approach to support the decisions that have to be made rather than as the "default" approach whenever there is unknown or uncertain information.

Contaminants of Concern	Analytical Technique/ Waste Decision Criteria	Detection Limits
PU-238, PU-239, PU-241	Alpha Energy Analysis/total nCi/g >100 reflecting the threshold for the definition of TRU waste	Solid 20 nCi/g Liquid 20 nCi/L
U-235	Alpha Energy Analysis/total nCi/g >100 reflecting the threshold for the definition of TRU waste	Solid 20 nCi/g Liquid 20 nCi/L
U-233	Alpha Energy Analysis/total nCi/g >100 reflecting the threshold for the definition of TRU waste	Solid 20 nCi/g Liquid 20 nCi/L

Sampling Strategy for Process Machinery

This table could be expanded to provide more detailed information such as the minimum sample size and other laboratory or quality assurance measures.

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#2 - For chemical storage cabinet and its contents:

End Points: (1) Remove all chemical containers from storage cabinet and properly dispose of wastes; (2) dispose of the storage cabinet; (3) dispose of any residual source materials near cabinet that could affect worker safety when clearing storage cabinet.

As an alternative, a project manager could develop end points separately for the chemicals, the cabinet, and any areas around the cabinet onto which spills occurred.

Work Scope Decisions to be Made: (1) Is data collection necessary to achieve the end points? (2) Can chemicals be removed safely from the cabinet and the facility in their current condition? (3) Can the chemical cabinet be removed as is, or will it require dismantlement?

All wastes from the cabinet must be removed to meet the end point. The second decision frames a tradeoff that must be made between taking samples with the chemical containers in place vs. first removing the containers to a safer, temporary location where appropriate sampling can proceed. This decision involves both environmental compliance and health and safety issues.

Evaluation of Uncertainties to Support Decision-Making:
1. Type of chemicals

- *Expected Condition*: Chemicals are not reactive.
- *Reasonable Deviation*: Chemicals are reactive.
- *Probability of Occurrence*: Low. Available records indicate that chemicals are expected to be a variety of typical organic laboratory chemicals.
- *Impacts*: Significant. Could pose immediate health and safety risks to workers. If reactive chemicals are present, waste handling procedures would need to be adjusted to limit potential chemical reactions during handling.
- *Strategy*: Conduct visual inspection of labels prior to decommissioning to determine if any reactive chemicals are present; develop contingency plan as part of hazard identification, analysis, and controls program if visual inspection indicates presence of a reactive chemical.

Work Scope Decision Rules:
1. If interviews of past and current employees and a thorough review of facility documentation do not yield any more information about the chemicals, develop procedures to overpack chemicals, remove them from the building, and sample once they are in an acceptable waste management facility.
2. If chemical containers are not intact or break during removal, then implement spill response procedures.
3. Storage cabinet is assumed to be mixed low level waste debris.

Hold Point. If reactive chemicals are found to be present during any activities, stop immediate activities; remove unnecessary personnel from the area, and overpack reactive chemicals in appropriate containers for immediate removal from the area before any additional activities occur.

When Data Collection is Necessary Following Removal from Facility: Once in a safe location sample each container in accordance with standard waste characterization requirements to determine hazardous and radioactive characteristics to decide on proper management.

Data Collection/Characterization: None needed during disposition work scope unless containers are not intact, then follow emergency response procedures.

In addition, a hold point may be appropriate to define what will allow workers sampling or removing the containers to stop work if conditions are no longer safe to proceed. This is an example of the needed integration between the planned work scope and the potential worker hazards the scope poses. More information on techniques to better implement hazard analysis planning is presented in sections IV.2 though IV.4.

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#3 – For the <u>floors and walls</u> throughout the facility:

<u>End Points</u>: (1) remove unacceptable levels of contamination from floor and areas around chemical cabinet; (2) identify floors and walls throughout the facility that are contaminated with fixed and removable wastes.

These end points are appropriate regardless of whether the end state for the facility is demolition or safe configuration for re-use. If demolition will occur, some removal of waste contamination may still be required before demolition debris can be disposed of. Likewise, fixed and/or removable contamination could pose an unnecessary hazard during demolition. The degree of decontamination necessary, if any, should be decided based on the disposal facility WAC; the allowable conditions that define the safe configuration scenario; and perhaps a hazards analysis to consider any adverse expensive consequences.

<u>Work Scope Decisions to be Made</u>: (1) Do contaminants on floor around chemical cabinet need to be sampled and decontaminated (e.g., are they TRU wastes requiring separate handling)? (2) Do facility workers face unacceptable hazards if they come into contact with removable debris on the floors and walls as they prepare and implement the planned disposition activities for the facility?

<u>Evaluating Uncertainties to Support Decision-Making</u>:
1. Types of floor contaminants

- *Expected Condition*: Contaminants on floor around cabinet are not TRU wastes.
- *Reasonable Deviation*: Contaminants on floor are TRU wastes.
- *Probability of Occurrence*: Low. Available records indicate that chemicals are expected to be a variety of typically organic laboratory chemicals. No TRU wastes are thought to be in cabinet, therefore there is little chance that the spills around the cabinet contain these wastes.
- *Impacts*: Significant. Could pose immediate health and safety risks to workers. If TRU wastes are present, waste handling procedures would be adjusted. Increased cost and schedule delays if TRU certification requirements are not planned.
- *Strategy*: Use visual inspections to identify areas where obvious extensive contamination has occurred. Take a limited sample if surrounding conditions do not explain likely nature of contamination.

As an alternative, a contingency plan to sample the floor for TRU constituents could be established only if TRU nuclides are found in the chemical containers or in the cabinet.

2. Removable contaminants present in floors and walls that pose a hazard to workers during future disposition activities anywhere in the facility.

- *Expected Condition*: Only fixed wastes are present within the walls and floors of the facility; large

An example of fixed waste is a radioactive spill or release

amounts of dust created by tearing down parts of the facility will not contain harmful constituents.

- *Reasonable deviation*: Removable contamination is present, it will be mobilized in the dust created by decommissioning parts of the facility, and it will pose a threat to workers or the environment.
- *Probability of Occurrence*: High. Wide range of contamination sources and condition of facility suggests removable contamination is likely present.
- *Impacts*: Significant. Could pose immediate health and safety risks to workers. Increased costs and schedule delays. Disposition plan could need to be revised depending on disposal of any contaminants.
- *Strategy*: Interview past and present employees and research facility records to determine how many spills were treated as fixed waste throughout the facility. Develop waste removal plans for areas potentially affected. Workers should wear PPE throughout the decommissioning process. If TRU constituents are found in cabinet, then collect core sample from top 3" of concrete for analysis; otherwise treat spills on floor as mixed waste debris.

<u>Work Scope Decision Rules:</u>

1. If interviews of past and current employees and a thorough review of facility documentation do not yield any information about areas where fixed or removable contamination may be present in the building, conduct visual inspections of walls and floors looking for indications of fixed waste (e.g., paint schemes to indicate where contamination may exist). Instruct all workers to wear the highest levels of PPE; develop contingency plan to dispose of building structure as if fixed waste is present.

<u>If Data Collection/Characterization is Necessary</u>: Only collect samples from visibly contaminated areas in the room where the chemical storage facility is located. In other rooms throughout the facility collect limited samples from walls and areas of rooms most likely to be contaminated.

resulting in contamination on the walls or floors that was painted over to prevent worker contamination. This waste is potentially harmful to workers tearing down sections of the facility structure.

#4 - For ventilation ducts throughout the building:

Endpoint: Remove all ducts and manage all materials in accordance with appropriate nuclear material and waste management procedures.

Work Scope Decisions to be Made: (1) Is data collection necessary to achieve the end point? (2) What is the volume and nature of nuclear materials contained within the ductwork? (3) Are other types of contaminants likely present in the ducts that could change the proposed work scope?

Data collection in the ducts will be difficult prior to removal and likely will not yield representative results. Therefore, contingency planning to address possible outcomes is likely a better approach.

Evaluating Uncertainties to Support Decision-Making:
1. Volume and nature of materials in ducts

- *Expected Condition*: >5 kg of nuclear material remains in the ducts.
- *Reasonable Deviation*: Greater volume of material than expected is contained in the ducts.
- *Probability of Occurrence*: Low. Records show approximately 5kg of material in total is suspected to remain between the duct system and the old process equipment.
- *Impacts*: Not highly significant unless the volume of material is much greater than expected. Material in ducts is already considered nuclear and will be disposed of accordingly.
- *Strategy*: Monitor volume and nature of nuclear materials in ducts and evaluate whether monitoring shows likely change in expected conditions as work proceeds.

Analysis might also be needed on the form and configuration of the materials to address any criticality concerns.

2. Other Contaminants Present

- *Expected Condition*: The materials in the ducts contain PU-238, PU-239, PU-241, U-235, U-233, and U-237 in various forms (fine powders, metal filings and shavings).
- *Reasonable Deviation*: Ducts contain other contaminants that would change planned work scope or handling approaches.
- *Probability of Occurrence*: High. Good facility records detailing the materials expected to be present in the ducts are not available. It is likely that other materials are present.

This may be an area where innovative characterization using technologies are worth using even if they can be tested and the results correlated with more traditional sampling approaches once the ducts are removed.

- *Impacts*: Significant. Likely increase to cost and schedule. Different waste handling approaches would be applied depending on the types of other contaminants present (i.e., >Class C LLW and TRU waste).
- *Strategy*: Sample each extent of ductwork once it is removed and follow pre-approved contingency plans to decide on packaging, handling, and waste management.

Work Scope Decision Rules:

1. If interviews of past and present employees and a thorough review of facility documentation do not yield enough information about the likely types and locations of nuclear materials or other contaminants, then develop contingencies to address other possible scenarios.

If Data Collection/Characterization is Necessary: Use remote sensing techniques to determine the approximate volumes of materials in each section of ducts once the ducts are removed.

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#5 - **For <u>pipes and tank</u> systems throughout the facility:**

<u>End Point</u>: (1) Remove all pipes and tanks and any residual wastes contained in them; (2) manage all materials under appropriate waste management scenarios.

<u>Work Scope Decisions to be Made</u>: (1) Is data collection necessary to achieve end points? (2) Do pipes contain standing liquids or substantial volumes of residual materials? (3) Are nuclear materials still present in the pipes and tanks?

The pipes will be removed, but the decision also involves determining whether special engineering approaches are needed to ensure that removal occurs safely.

<u>Evaluating Uncertainties to Support Decision-Making</u>:

1. When wastes are present in pipes and tanks

- *Expected Condition*: Pipes and tanks do not contain residual wastes and material.
- *Reasonable Deviation*: Materials in pipes and tanks contain residual wastes and materials in sufficient quantities to warrant waste removal prior to decommissioning.
- *Probability of Occurrence*: High. Pipes drained material into tanks for proper disposal but records do not detail the processes used to drain and clean the pipes at the time the facility was shut down.
- *Impacts*: Significant. Could pose immediate health and safety risks to workers. For example, if chemicals are present that could have adverse chemical reactions, specific engineering techniques must be developed to remove any liquids or material.
- *Strategy*: Likely to require limited sampling in obvious collection points prior to conducting each segment of work to address because records do not provide enough information on what, if any wastes are present.

These analyses may need to be conducted individually for each separate pipe or tank system if they are not similar or are in different conditions relative to whether wastes are still present.

2. Nuclear Material Present

- *Expected Condition*: Nuclear materials are present in the residual material still contained in pipes and tanks in concentrations sufficient to warrant special handling procedures.
- *Reasonable Deviation*: Pipes and tanks contain only a combination of radioactive, mixed and hazardous wastes.

When the risks posed are potential chemical or nuclear reactions, sampling to determine its contents prior to conducting disposition activities is probably an appropriate course of action. Contingencies may also be needed to address issues that

- *Probability of Occurrence*: Low. Because the pipe and tank systems operated throughout the facility for drainage purposes and there are no closeout records, it is likely that nuclear materials are present.
- *Impacts*: Significant. Schedule delays could occur due to changes in waste handling, remediation, transportation, and disposal procedures.
- *Strategy*: Will need contingencies prepared in workplan to address a wide variety of possibilities; it is likely that sampling will need to be done in each tank and pipe system prior to commencing disposition activities to address all possibilities.

sampling cannot address (e.g., the full range of waste disposal scenarios if small amounts of contamination are mixed).

An alternative strategy might be to consider developing a facility wide pipe/tank decontamination strategy as a step in the deactivation program, then return with a pipe/tank removal program once all the contents are known to be drained.

Work Scope Decision Rules.

1. Limited sampling will be conducted in each discrete tank/pipe system to determine possibly unacceptable health and safety circumstances.
2. If pipes contain standing liquids or substantial volumes of residual nuclear materials, then develop specific engineering approaches to remove the liquids or materials, else treat pipes as empty.
3. If a combination of radioactive, mixed, and hazardous wastes is present and does not meet the definition of TRU, then handle as low level waste and send to the on-site LLW storage facility after proper packaging and notify the waste management department to identify the proper disposition path. If hazardous constituents are present, treat as mixed low level wastes, identify the appropriate RCRA treatment standards, and determine if on-site treatment or management capacity exists. Otherwise, if wastes contain PCBs, manage in accordance with the site's PCB Waste Management Plan.

Substantial study of the pipe/tank designs may allow sampling in a few places in the system as likely "worst case" scenarios, and those scenarios could be the basis for a set of standard decontamination procedures for all of the tank systems.

If Data Collection/Characterization is Necessary: Given ALARA (as low as reasonably achievable) concerns, a combination of volume estimates, process knowledge, and remote surveys will be used to make a worst case estimate of the highest areas of contamination.

#6 - For <u>hydriding furnace</u>:

<u>End Points</u>: (1) Remove furnace; (2) manage components as debris wastes under appropriate WAC procedures of selected waste management facility.

<u>Work Scope Decisions to be Made</u>: (1) Is furnace still contaminated with tritium above the levels of concern for waste acceptance? (2) Are other contaminants present in the furnace room that would impact the planned disposition of the unit?

A key decision will be the degree of dismantlement of the furnace that is required.

<u>Evaluating Uncertainties to Support Decision-Making</u>:
1. Contamination above levels of concern for waste acceptance of the furnace as debris.

- *Expected Condition*: Resulting contamination from tritium fire in 1974 is within allowable levels specified in waste acceptance criteria.
- *Reasonable Deviation*: Resulting contamination is above allowable levels specified in waste acceptance criteria.
- *Probability of Occurrence*: High. The levels of resulting contamination within the facility after the fire occurred are not contained in current records.
- *Impacts*: Significant. Could pose immediate health and safety risks to workers. Waste handling procedures would have to be adjusted. Specific engineering approaches must be developed to remove the contamination.
- *Strategy*: Conduct some "worst case" planning analyses to determine if tritium decay has reduced risks to acceptable levels; otherwise, evaluate waste handling approaches assuming tritium still poses substantial risks and waste management issues.

One strategy to be considered is to evaluate the tradeoff between when tritium decay will lower risks of decommissioning vs. the costs of managing those risks today. The decommissioning schedule may or may not allow time for decay to reduce the risks, but the cost/time tradeoff should be evaluated.

2. Other contaminants present

- *Expected Condition*: Area only contains tritium contamination
- *Reasonable Deviation*: Other contaminants are present.
- *Probability of Occurrence*: High. If the fire damaged the walls and ceiling, other contaminants (i.e., asbestos) could be contributing contaminants in the room.
- *Impacts*: Significant. Delays due to changes in waste handling, remediation, transportation, and disposal

procedures.
- *Strategy*: Monitor conditions as work proceeds to determine if other contaminants are present.

Work Scope Decision Rules:
1. If interviews of past and present employees and a thorough review of facility documentation do not yield enough information about the nature of contamination, then prepare plans based on a worst-case scenario.
2. If furnace is contaminated above allowable levels specified in waste acceptance criteria, then determine appropriate decontamination approaches, otherwise remove the furnace and dispose.

Data Collection and Characterization. Consider sampling in worst-case locations most likely to be contaminated to determine current status.

IV.2 - HAZARD IDENTIFICATION AND CHARACTERIZATION

Hazard identification should be focused primarily on those areas of the plant where work will be performed or workers may be present.

Key Concepts Illustrated:
Concurrent with the definition of an adequate work scope is the requirement to identify hazards present in a facility. Hazard identification, followed by hazard analysis and controls (see next section, IV.3) is a systematic process of evaluation of the workplace and the work to be performed to ensure the health and safety aspects of disposition are considered and planned for when deciding on a work scope.

As outlined in *DOE Technical Standard 1120-98*, during this process, project managers may need to:

$ Assess existing facility status by collecting and reviewing available facility operating records and existing hazard baseline documentation;
$ Interview past and present employees to supplement incident and operations information;
$ Perform a facility walkdown with appropriate personnel, project team representatives and documentation staff;
$ Review lessons learned reports and occurrence reports; and
$ Document the hazards determined to be associated with planned work activities.

The following sections present examples of the way each step in this process may be conducted for the model facility and how from the information gathered, hazard and work scope decisions can be further evaluated. It also provides guidance on techniques project managers may use to evaluate the types of information that the project team may need. Highlighted throughout these examples is the important correlation between the work scope definition step of a project and the corresponding hazard identification techniques. In all cases, hazards will need to be identified, analyzed, and controlled for each step of the planned work scope that has been identified. The techniques used to define hazards may also be valuable in identifying when characterization is needed and when other sources of data are adequate to plan the project.

Example of Hazard Identification Applied to MRF Facility

1. Review Existing Documentation to Minimize Further Data Collection:

A record search can provide much insight into facility condition and hazards at minimal expense and should always be used as an initial basis for determining where gaps in knowledge and hazard information exists.

A critical first step is to collect all relevant documentation describing the facility and hazards. Valuable sources include hazard baseline documents, such as: SARs, TSRs, HASPs, Environmental Impact Statements (EISs), Environmental Assessments (EAs), design documents, operational records, purchasing records, MSDSs, medical and environmental reporting data, and Unusual Occurrence Reports (UORs). In many cases, these documents can inform where likely hazards exist and what precautions are necessary when work is conducted. In other cases, these documents will raise new uncertainties that need to be evaluated and planned for (similar to the work scope uncertainties already illustrated). The same type of uncertainty analysis method used for work scope decisions can be used to evaluate uncertainties associated with potential hazards.

A review of the existing documentation reveals that there are three primary data gaps that are important when conducting hazard identification: (1) the reliability of the HVAC system; (2) the level of contamination from the tritium fire in 1974; and (3) the type(s) and amounts of chemicals in unmarked jars in a storage cabinet.

The results of a review of existing documentation for this facility show some significant gaps in knowledge even after the available documentation is reviewed.

2. Conduct Employee Interviews to Fill Data Gaps

Example techniques that can be used for interviewing employees

Current and past facility employees are interviewed to attempt to fill in these data gaps. For this facility, the following information is gathered.

include planned sessions that solicit information before workers retire, or sessions in which former workers are invited to return to contribute their knowledge. Consider video or audio to preserve the future record.

Level of contamination from tritium fire in 1974: Three former S&H (safety and health) personnel employees were asked how much tritium was present in or around the hydriding furnace before the fire occurred, how much was released as a result of the fire, and how much remained in the furnace. The employees did not know the amount of tritium present before the fire, but knew that radiation samples were taken immediately following the fire. The employees were able to remember at that time that a sample showed the estimated total concentration of contamination in one room near the furnace was approximately 760,000 pCi/g. The employees were not aware if the contamination had spread to nearby areas of the facility. However, they did indicate that the contamination likely extended to the immediate area surrounding the furnace (e.g., floor, ceiling, and walls). These surfaces were scrubbed after the fire, according to one employee, but he was unsure about the processes/technology used to conduct this cleanup.

An uncertainty analysis approach can be used to help decide what aspects of the problem the employee interview, walkthroughs, and documentation reviews need to address and the impact of this information on subsequent decision-making needs. For example:

1. Level of Tritium Contamination Present

***Expected Condition*: Tritium concentration remains widespread throughout the facility as a result of the 1974 fire.**

***Reasonable Deviation*: Tritium release from fire was not significant or has decayed over time to reduce worker hazards.**

***Probability of Occurrence*: Low. The prudent assumption is that the residual from the tritium release remains a substantial threat to worker health and safety.**

***Impacts*: Significant. Levels of tritium are critical to establishing appropriate hazard controls.**

***Strategy*: Determine if former employees can provide the needed additional information about the extent of**

Reliability of the HVAC system: Two former and one current employee who were or are currently involved in the maintenance of the HVAC system were interviewed. Specifically, employees were asked how many times the system had needed to be repaired, what the nature of the repairs was, whether there was any inconsistent performance or sporadic malfunctioning, and when the last check on the system was conducted. Although one former employee recalled some sporadic incidents in which the HVAC system was not cooling properly, the current steward of the system could not recall any such incidents in the past three years. Employees who worked on the system referred to repair documents, which stated that the repair record was Agood.@ The system is given a thorough examination every five years and was last checked in 1996. At that time, the system was determined to be in Agood@ condition. Employees were also questioned about the extent of airborne contamination and the efficiency of the HVAC system to control the level of indoor air contamination.

The employees believe that the HVAC system has been effective but were unsure about the levels of plutonium and uranium remaining. The HVAC system was not modified after the facility mission was terminated in 1986.

contamination.

Type(s) and amounts of chemicals in unmarked jars: Past employees were fairly certain that the jars contained industrial solvents typically used during routine maintenance. However, specific types of chemicals could not be confirmed.

3. Conduct Facility Walkdown to Gather Visual Evidence

Because unknown levels of contamination may be present, project team members should take appropriate precautions when entering possible contaminated areas. For example, personal protective equipment (PPE) should be worn in preparation for the greatest amount of contamination known to be present. This level of PPE should be worn until the actual highest levels of a facility's contamination are known.

A walkdown performed by a multi-disciplined project team is needed to assess and confirm existing facility conditions and inherent hazards. A walkdown is a visual, usually non-intrusive inspection, which may include inspecting the condition of equipment, identifying potential sample locations, and checking for evidence of contaminant spills. The walkdown should be approached systematically. Each phase of the walkdown (i.e. before, during, and after the walkdown) should have its own checklist of items under consideration to ensure a productive and safe walkdown.

The walkdown conducted at the Metallurgical Research Facility included a structural engineer (to inspect building integrity), an industrial hygienist (in anticipation of sampling needs), a camera person (to record the initial walkdown to avoid repeat visits), and a health physicist (to determine likely areas to contain contamination). The project team primarily focused on inspecting the three areas of concern identified as a result of the employee interviews. During the walkdown, the project team identified potential sample locations in these areas to support the decision rules already developed during preliminary scoping activities. Some key information gathered in the walkdown included: 1) an exposed opening in ceiling insulation; and 2) hairline cracks in the floor of the research and testing area.

The results of the walkdown were documented in a report. These results will be used to further refine the uncertainty analysis, planned work scope, and hazard analysis and controls process. (See Section VII.)

Next Steps: Following hazard identification, more formal hazard analysis is required before work can begin. Typically, as outlined in *DOE-STD-1120-98,* hazard analysis is performed during the planning phases of a project when a general outline of the work scope is known, but the details of individual disposition tasks have yet to be fully determined. The next section outlines techniques to conduct effective hazard analysis.

IV.3 - HAZARD ANALYSIS AND CONTROLS

A thorough hazard characterization effort, including a facility walkdown, will reduce uncertainties, effort and costs associated with a hazard analysis.

Key Concepts. Hazards associated with planned D&D work must be identified and evaluated to establish work controls and ensure compliance with applicable environment, safety and health requirements.

Techniques Recommended in DOE-STD-1120-98 Applied to MRF Example:

The expected results of the sampling (e.g. amount of radioactive or hazardous material found) may not be the same as the actual results. Therefore, an uncertainty assessment should also accompany the analysis of hazards.

As a first step, the multi-disciplined team must identify the quantities, form, and location of remaining hazardous materials. Based on hazard characterization activities, including a facility walkdown, the information for this facility is as follows:

Rad Material:	Uranium (U-235, U-233) and Plutonium (Pu-238 and 239)
Form:	Fine powder, metal filings and shavings
Quantity:	Approximately 5 kg
Location:	Furnace, gloveboxes, and ventilation ducts
Haz Materials:	Asbestos, lead, and unknown chemicals
Form:	Asbestos and lead are fixed, chemicals are in liquid state
Quantities:	Small quantities of chemicals in jars
Location:	Asbestos in roof insulation, chemicals in storage cabinet, lead in paint fixed to walls

The quantity of fissionable material exceeds isotopic thresholds for a Hazard Category 2 facility as provided in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques For Compliance with DOE 5480.23, Nuclear Facility Safety Analysis Requirements*. Also, the unknown isotopic mix and exact location of material is such that the potential for a criticality accident cannot be ruled out (i.e., 5 kg of material is greater than theoretical mass limits for criticality which are 450 g for Pu-239, 500 g for U-233, and 700 g for U-235). Therefore, the facility is considered a nuclear facility and subject to nuclear facility safety analysis (i.e., hazard and accident analysis).

Hazard categorization is used to determine whether a facility is classified as Anuclear@ and subject to safety analysis requirements of DOE 5480.23. Hazard Category 2 facilities have a potential for significant impact to onsite personnel.

Facility Level Hazard Analysis

DOE-STD-1120-98 allows for less costly and less resource intensive methods for meeting nuclear facility safety analysis requirements when a facility is conducting facility disposition. Appropriate conditions for when this can occur are when the form of nuclear material is fixed contamination or activated metals. The MRF radiological inventory is a mix of powder and metal shavings, which is a dispersible non-fixed form. Therefore, some level of hazard and accident analysis must be performed in accordance with DOE 5480.23, *Nuclear Facility Safety Analysis Reports*.

However, this analysis does not have to be expansive. Because the facility is not active, only residual hazards remain, and a bounding hazard analysis was conducted prior to shutdown that is still available as input to analyzing disposition activities, alternative approaches to a SAR may be available. In this case, an evaluation of hazards and accidents should be sufficient if it meets the requirements of OSHA HAZWOPER (29 CFR 1910.120), as well as minimal accident analysis requirements of DOE 5480.23. The analysis should consider (1) material forms, quantities and location, (2) energy sources and potential initiating events associated with external factors and disposition activities, (3) preventive features, (4) mitigative features, (5) a qualitative evaluation of frequency of potential accidents, and (6) estimated consequences. A simple format for presenting the results of this analysis is shown in Table 1. This can be used to satisfy risk assessment requirements of DOE 5480.23 and OSHA HAZWOPER.

***DOE-STD-1120-98* discusses two focus areas of hazard analysis for facilities with hazardous materials: facility level and task level. The facility level analysis will focus on mechanisms, consequences, and likelihood of breaching confinement of MRF material inventory, as well as facility controls to prevent and mitigate consequences. The task level analysis will address worker hazards associated with performing D&D work tasks.**

The hazard/accident analysis should also be used as the technical basis to satisfy hazard evaluation requirements of DOE O 151.1, *Emergency Management*, and any risk assessment as required by CERCLA. This integration of activities will reduce duplication of effort and avoid inconsistencies among different environmental and safety requirements.

Task Level Hazard Analysis

The disposition of MRF will involve a series of work tasks such as decontamination and removal of process equipment, removal of lead paint and asbestos, and de-energizing electrical systems. Each one of these tasks present worker hazards and must be evaluated as each task is being planned. This process can be made simple by the use of a job hazards analysis, which breaks a task down into its work steps, assesses worker hazards with each step and determines needed hazard controls. Table 2 provides a sample evaluation of job hazards for an MRF deactivation task.

The results of task level analysis should be included into work packages prepared during planning of the task.

Data from facility level analysis should be used as input to analyzing task hazards.

The job hazards analysis process should involve a work planner, safety professional, and workers who will be performing the task.

The results of hazard analysis activities as documented in the HASP, along with additional risk

Hazard Controls

As outlined in *DOE-STD-1120-98*, hazard controls for the protection of facility disposition should be developed based on a strategy that is consistent with the hierarchy of controls required by DOE-O-440.1. These strategies include:

- Hazard Elimination (design hazards at a number of planned work scopes);
- Hardware controls (establish engineering controls to prevent unacceptable exposures);
- Administrative Controls;
- Personal Protective Equipment;
- Occupational Medical Program;
- Monitoring; and
- Training

Example of Hazard Controls for MRF

Table 2 of this section also outlines a sample control program for the MRF Facility.

Criteria to evaluate changes in controls as work occurs include:

- Hazardous condition is no longer present;
- Hazardous substance's physical form has changed to a less dispensable form; and
- Hazardous substance quantities are no longer present or have been reduced to the point where the consequences of releases are no longer a concern.

IV.4 - HAZARD BASELINE DOCUMENTATION

The MRF is conducting decommissioning and is, therefore, subject to OSHA HAZWOPER requirements, which requires preparation of a Health and Safety Plan that documents facility information, hazards and necessary controls. Additionally, the facility is classified as nuclear, which requires a safety analysis report that meets the requirements of DOE 5480.23. Both documents contain similar information, albeit the SAR requires much more substantive data on facility controls, defense-in-depth measures and accident analysis. *DOE STD-1120-98* suggests that decommissioning projects use a HASP as the hazard baseline document that, taken together with the Decommissioning Plan, satisfies both sets of requirements. In

assessment of environmental impacts, should be integrated into CERCLA documentation consistent with agreements with EPA and State regulators. For non-time critical removal actions, this typically includes documents such as Remedial Design Reports and Engineering Evaluation/Cost Analysis (EE/CA) Reports.

DOE STD-1120-98, Volume 2, Appendix I provides a convenient method for determining appropriate hazard baseline documentation.

Radiation Work Permits required by 10 CFR 835 should already contain much of the radiation control information presented in the HASP.

To further streamline project documentation, the HASP can

the case of DOE 5480.23, a graded approach justifies the use of a more streamlined and less costly hazard baseline document such as a HASP since no active operations are being conducted in the facility. The topics addressed by the HASP, include the following:

Key Personnel
Hazard and Accident Analysis Results
Training
Personal Protective Equipment
Temperature Extremes
Medical Surveillance
Exposure Monitoring and Air Sampling
Site Control
Decontamination
Emergency Response/Contingency Plan
Emergency Action Plan
Confined Space Entry
Spill Containment

Further information on HASP topics can be found in EM-STD-5503-94, *EM Health and Safety Plan Guidelines*, EM-STD-5502-94, *Hazard Baseline Documentation*, and the *DOE Handbook Occupational Health and Safety During Hazardous Waste Activities.*

IV.5 TRANSITION FROM PLANNING TECHNIQUES TO WORK PACKAGE PREPARATION

For the techniques outlined in this model workplan to lead to the desired streamlining, they must be further incorporated into the work packages that direct the actual execution phase of disposition projects. This section provides guidance on how to make this transition from the project level to task level planning.

Table 2 illustrates an example for one end point and the greater level of planning details at which task work packages are prepared during disposition activities. To ensure that the streamlining concepts developed in the model workplan are implemented in work packages, project managers should do the following:

- <u>Make the multi-disciplinary project team or core team a critical part of the work package planning and work</u>

also be used to satisfy many of the emergency preparedness requirements contained in DOE O 151.1, *Emergency Management*.

implementation processes. As is the case in overall project planning, a multi-disciplinary team or core team is a critical component of the decision making process. As individual work packages are prepared, the role of the team becomes even more critical as specific engineering and work approaches are decided on, the individual hazards from these approaches are analyzed, and controls established. The use of such a team structure is mandatory to meet the required elements of an integrated safety management program. It should also prove to be an important driver for reducing unnecessary work requirements.

- Incorporate uncertainty planning implications into the work package structure. For each space, system, or major equipment evaluated through the end state/end points process through the recommended systematic process, there will be a set of uncertainties identified that will need to be managed when actual work occurs. These uncertainties, decision rules, and strategies need to be reflected at the work package level of planning. For example, if the uncertainty analysis outcome is that contingency plans or monitoring approaches need to be established, the details should be incorporated into the work package itself to provide implementation teams clear direction about what to do if an uncertainty's reasonable deviation is observed.
- Make necessary changes to the work packages and individual tasks as data are collected about uncertainties during actual work. Because of the inherent nature of uncertainties, new information may be gathered during the work implementation process that will affect future work scope. When this occurs, the work packages must be updated as those decisions are made. For example, when a contingency plan is triggered and an actual course of work is established based on monitoring or conditions observed during work.
- As tasks are added or removed from work packages and as work is completed, continually assess the hazard analysis and controls required and reduce or increase the controls as appropriate. This type of step should be taken when one or more of several conditions occur:
    1. Materials are removed from a facility, which in turn can lead to a reduction of controls; and
    2. Materials are found in different or greater

quantities than planned, leading to additional controls being placed on the work.

- Use quantitative criteria, whenever possible, to determine when work is completed. To the degree feasible, work packages should specify quantitative levels to be achieved to signal when an end point has been achieved. End points may sometimes specify those levels, but if they do not, work packages should be the place where the levels are included.

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Table 1
MRF Hazard Evaluation and Controls Analysis

Part A [Note: See tables that follow for definition of Frequency (Rate), Consequences, and Scenario Classification Rankings]

Process Identification		Potential Accident Events (Hazards)	Rate*	Prevention Control Features		Consequences[2] (See Part B)			Mitigation Control Features[3]		Scenario Classification[4] (See part C)
Area	**System**			**Design**	**Administrative**	Worker	On-site	Public	**Design**	**Administrative**	
Research Area Room 1	Lathes	Uranium chips are ignited by disturbance of the material due to a spill or movement during D&D	A	Types of containers chosen ill limit the possibility of ignition	Establish fire protection program	H	L	L	Ensure area is protected by working automatic sprinkler system	Develop procedures for training, fire department response	III
	Ventilation Ducts	Release of airborne contamination when removing filter and ducts	A	None	Establish work control planning procedures, training, and a radiation control program	L	L	L	Ensure adequate ventilation exhaust and HEPA system	Develop procedures, training, and use appropriate personal protective equipment	III
Research Area Room 2	Recovery Furnace	Process residues accumulate in the furnace process exhaust into a critical configuration	A	Evaluate: 1) Drain holes in ductwork low points, 2) cyclone and bag house trap overflow lines, 3) integrity of ductwork to preclude inleadage	Establish: 1) holdup survey program, 2) surveillance and maintenance, 3) procedures and training	H	M	M	Test and operate a criticality Alarm System	Develop emergency response training and procedures	I
	Material Containers	Container is dropped, spilling residual U and Pu materials	A	Ensure containers are closed and sealed before moving	Establish procedures, training	L	L	L	Evaluate area ventilation	Develop procedures, training, and use personal protective equipment	III

Process Identification		Potential Accident Events (Hazards)	Rate*	Prevention Control Features		Consequences[2] (See Part B)			Mitigation Control Features[3]		Scenario Classification[4] (See part C)
Area	System			Design	Administrative	Worker	On-site	Public	Design	Administrative	
	Ventilation Ducts	Release of airborne contamination when removing filters and ducts	A	None	Establish work control planning procedures, training radiation control program	L	L	L	Establish adequate ventilation exhaust and HEPA system	Develop procedures, training and use personal protective equipment	III
Metal Hydride Room	Glovebox	Release of airborne contamination during disassembly or vacuuming	A	None	Ensure adequate work Control planning procedures, training, radiation control program	L	L	L	Establish adequate room Ventilation, air monitors	Develop procedures, training, and use personal protective equipment	III
Office	N/A	None		N/A	N/A				N/A	N/A	
Hallway	N/A	None		N/A	N/A				N/A	N/A	

Notes:

S Frequency levels are assigned based upon operating experience and expertise of safety analyst. Codes used in the table are as follows: A B anticipated accidents that could result from operator error or violation of an administrative control (general frequency range $\geq 10^{-2}$ per year); U B unlikely events are those that involve a series of operator errors and/or equipment failures (general frequency range between 10^{-2} and 10^{-4} per year); and EU B highly unlikely events are those that are typically not supported by physical conditions and require a complex series of equipment failures or operator error (general frequency range is greater than 10^{-4})

S Consequences are estimated based on upon the quantity of hazardous material involved in the accident, the form of the material and the release mechanism. Codes used in the table are shown in Part B.

S Scenario Classification Based on Consequence/Frequency Combination, See Part C.

Table 1 (cont…) MRF Hazard Evaluation and Controls Analysis

Part B – Consequence Type Codes

Consequence Level	Type	Off-site	On-site (100m)	Facility Worker
High	Radiological	> 5 rem at site boundary	> 25 rem at 100 m	Potential for prompt death
	Chemical	> ERPG-2 at site boundary	> ERPG-3 at 100m	Potential for prompt death
Moderate	Radiological	>0.1 rem at site boundary	> 0.5 rem at 100m	Potential for serious injury
	Chemical	Not applicable	Not applicable	Potential for serious injury
Low	Radiological	<Moderate	<Moderate	<Moderate
	Chemical	<High	<High	<Moderate

Part C – Scenario Classification Based on Frequency/Consequence Combination

Frequency Level	Consequence Level		
	Low	Moderate	High
Anticipated	III	I	I
Unlikely	III	II	I
Extremely Unlikely	IV	III	II

Table 2: Example of Hazard Analysis and Controls Documentation for a Single Task as Part of Work Scope at MRF Facility
Task X.X- REMOVE VENTILATION DUCTS AND FILTRATION SYSTEM IN RESEARCH ROOM 1

End State: Removal of ducts and corresponding contaminants

End Points: Removal of ducts and appropriate management of wastes as contaminated as debris; appropriate management of any materials found within the ductwork

Task Conditions: 1) Ducts contain residual plutonium and uranium; 2) Some ductwork is corroded and duct integrity is questionable; 3) loose surface contamination is present on outside of ducts

Work Step	Environmental Considerations	Hazards	Controls
De-energize ventilation system and ensure its locked-out	None	Electrical shock	Lock-out/Tag-out procedure Safe work permit Plant electrical procedures
Seal outside of ducts with fixative compound	Ensure fixative compound used does not introduce new contaminants that could impact waste status	Uptake of contamination Uptake of chemical compounds in fixative Fall hazards from elevated platforms	Protective clothing Full-Face respirators Radiation work permit Plant procedures on fall protection
Cut ductwork at flanges (length not to exceed 10 feet) temporarily seal all cut ends with bags, and bring to ground level.	Given likely contents of ducts (i.e., TRU wastes) have packaging present to handle anticipated size of ductwork or re-size material to fit in approved packaging	Struck-by hazards Sharp metal Cutting hazards Uptake of contamination Fall hazards from elevated platforms	Protective clothing Full-Face respirators Radiation work permit Plant procedures on cutting tools Plant procedures on fall protection
Vacuum residual material out of ducts	Manage all waste, vacuumed appropriately including any waste generated during decontamination of equipment; manage any new conditions that arise from presence of other contaminants.	Uptake of contamination	Radiation work permit to control any possible adverse consequences
Wrap and seal entire length of ductwork and send to staging area for decontamination.	Apply requirements of TRU waste certification program at this point to ensure	Sharp Metals	Radiation work permit to control any possible adverse consequences

APPENDIX A
DOE ORDER 430.1A, *Life Cycle Asset Management* (LCAM)
Parts F and G

This Appendix provides the primary DOE requirements for conducting D&D activities as outlined in DOE Order 430.1A. The following is the language of 430.1A(f) and 430.1A(g), the two most pertinent sections of the order to the model workplan.

1. 430.1A(f)

f. The process for the operation and maintenance of physical assets shall ensure, as a minimum, the following:

(1) The identification, inventory, and periodic assessment of the condition of physical assets in the maintenance program.

(2) The establishment of requirements, budgets, and a work management system to maintain physical assets in a condition suitable for their intended use.

(3) The preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition.

(4) A configuration management process to ensure the integrity of physical assets and system.

(5) The efficient and effective management and use of energy and utilities.

(6) A method for the prioritization of infrastructure requirements.

(7) The management of backlogs associated with maintenance, repair, and capital improvements.

(8) A method to ensure that prior to the completion of mission activities (e.g., production, research, etc.) actions are implemented to place the facility, systems and materials in stable and known conditions, and to ensure hazards are identified and known, pending transfer or disposition. For facilities that have already completed mission activities and are awaiting transfer or disposition, ensure that actions are taken to eliminate or mitigate hazards and provide adequate protection to workers, the public and the environment. In both cases, actions shall be based on an assessment of the remaining hazards at the time when mission activities are completed, or prior to transfer or disposition for facilities that have already completed mission activities. These actions shall include but not be limited to:

(a) Identifying and characterizing hazardous and radioactive materials and wastes remaining in systems/facilities and providing for their stabilization (if necessary), adequate storage until they are removed from the facility, and (unless otherwise agreed to prior to (facility transfer) removal.

(b) Assessment and adjustment (if necessary) of the facility authorization basis to ensure it continues to reflect conditions in the facility pending disposition.

(c) Conducting surveillance and maintenance activities required to maintain the facility and remaining hazardous and radioactive materials, wastes, and contamination in a stable and known condition pending facility disposition.

(d) Identifying and allocating resources needed to maintain stable and known conditions pending disposition.

2. 430.1A(g)

g. The process for the disposition of physical assets shall ensure, as a minimum, the following:

(1) Application, as appropriate, of guidelines contained or referenced in DOE STD-1120-98, INTEGRATION OF ENVIRONMENT, SAFETY AND HEALTH INTO FACILITY DISPOSITION ACTIVITIES.

(2) The use of a DOE-certified real estate specialist to execute the disposal of real estate, including the disposal of Departmental improvements without the underlying land.

(3) A method whereby land and facilities (Candidates for Transfer) are either transferred to other Program Offices, or are determined excess, available for disposal, and disposal procedures are initiated.

(4) To match the Departmental budget cycle, the normal date of transfer for a facility shall be the first October 1 after the two year anniversary of the date the receiving organization is notified, unless the parties reach another agreement. As land and facilities are transferred from one Program Office to another, the appropriate funding and budget target are transferred with it.

(5) In addition, for the transfer of contaminated facilities, as a minimum the following apply:

(a) Completion of a Pre-Transfer Review, with participation by the Office of Environment, Safety and Health when requested or directed, for transfer of facilities for disposition whose scope shall be commensurate with the existing hazards.

(b) Development of a signed agreement by relevant Secretarial Officers to document scope, conditions, state of readiness, and associated funding, when transferring facilities between Program Offices. This includes a budget resources plan to manage the facility until funding is provided to the receiving program through the normal budgeting process.

(6) In addition, for execution of contaminated facility disposition, as a minimum the following apply:

(a) A method to ensure that deactivation, surveillance and maintenance, and decommissioning activities are appropriately planned, conducted, and documented in a manner consistent with the guiding principles and core functions of the Department's integrated safety management and facility disposition policies. The disposition process shall provide for:

(i) The collection of baseline data to support a physical, chemical, and radiological characterization, updated as necessary to reflect changes in facility conditions during the disposition process.

(ii) Surveillance and maintenance activities that correspond with facility conditions, including changes resulting from disposition activities.

(iii) A method for identifying, assessing, and evaluating alternatives for deactivating and/or decommissioning and for selecting and documenting a preferred alternative.

(iv) An end-point process in deactivation and decommissioning planning that identifies specific facility end-points and activities needed to achieve those end-points.

(v) A method for detailed engineering planning and for plan documentation to execute the preferred deactivation and/or decommissioning alternative.

(b) The use of Non-Time-Critical Removal Action as the approach for decommissioning, using the tailored process negotiated with the Environmental Protection Agency, with continued Defense Nuclear Facilities Safety Board oversight to the extent authorized by law.

(c) The development of a final report, or equivalent document, for each deactivation and/or decommissioning project. Where deactivation and decommissioning are conducted as a single, uninterrupted activity, only one final report, or equivalent, is required.